

Serial No. 09/738,070

Changes Made," showing the current amendments to the specification and claims is attached hereto.

Please amend the above-identified application as follows:

**IN THE SPECIFICATION:**

Delete the paragraph beginning at page 1, line 18, and ending at page 2, line 3, and replace with the following:

a1  
When the former single plate displacement element is used, there is scant internal loss of the displacement element itself, since the drive force generated by the displacement element is transferred to the elastic member without attenuation. Accordingly, the drive efficiency is high. However, since the total surface area of the displacement element is small and the impedance is high, the drive voltage must be increased in order to increase the output. Particularly when used in a portable device, several batteries must be used, or a booster circuit must be used. For this reason such a solution is contrary to the demand for lower cost and more compact and lighter weight devices.

Delete the paragraph beginning at page 2, line 22, and ending at page 3, line 4, and replace with the following:

a2  
These and other objects are attained by one aspect of the present invention providing a displacement element for generating a specific displacement by piezoelectric effect, a displacement expander for transmitting the displacement of the displacement element and expanding this displacement, a transmitter for transmitting the displacement expanded by the displacement expander to a driven member, and a presser for pressing the transmitter against the driven member, wherein the oscillation

a2  
cont

of the displacement element is restrained by the oscillation of the displacement expander.

Delete the paragraph beginning at page 8, line 10, and ending at page 8, line 24, and replace with the following:

a3

When two mutually intersecting and independent movements are combined, the intersection point describes a path in accordance with an elliptical movement method (Lissajous method). In the actuator of the present embodiment, various paths can be obtained by changing the phase difference and amplitude of the drive signals used to drive the first piezoelectric element 10 and the second piezoelectric element 10'. The rotational direction, rotational speed, rotational force (torque) and the like of the rotor 40 can be controlled by controlling the path of the tip 20. Specifically, the rotational speed is increased if the diameter of the path of the tip 20 is increased in a tangential direction relative to the rotation direction of the rotor 40. The rotational force is increased if the diameter of the path of the tip 20 is increased in a normal line direction relative to the rotor 40. Furthermore, if the phase is reversed, the rotational direction can be reversed.

Delete the paragraph beginning at page 9, line 17, and ending at page 9, line 25, and add the following:

a4

The relationship between the frequency of the drive signal and the displacement (amplitude) X1 and X2 are shown in FIGS. 7a and 7b. As can be understood from FIG. 7a, at a specific frequency  $f$  ( $f=(k_2/m_2)^{1/2}$ ), the displacement X1 of the piezoelectric elements 10 and 10' becomes zero [0]. In the present embodiment, the frequency  $f$  at which the displacement X1 of the piezoelectric elements 10 and 10' becomes zero is used to drive the piezoelectric elements 10 and 10'. In equation (1) above, the condition

24  
cont.

under which the displacement X1 of the piezoelectric elements 10 and 10' becomes zero is stated below.

Delete the paragraph beginning at page 10, line 7, and ending at page 10, line 10, and add the following:

The displacement X2 of the elastic members 25 and 25' is equal to the extension from equation (4) when the drive force of the piezoelectric elements 10 and 10' is statically added to the elastic members 25 and 25'.

25

[Delete the paragraph beginning at page 10, line 11, and ending at page 10, line 16, and add the following:]

The negative sign on the displacement X2 ( $= -F_0/k_2$ ) of the elastic members 25 and 25' reflects that the phase of the elastic members 25 and 25' are the opposite phase of the drive force (exciting force) of the piezoelectric elements 10 and 10'. That is, the oscillation of the elastic members 25 and 25' nullifies the oscillation of the piezoelectric elements 10 and 10'.

Delete the paragraph beginning at page 12, line 17, and ending at page 12, line 22, and replace with the following:

26

Although the present invention has been fully described by way of examples with reference to the accompanying drawings, it is to be noted that various changes and modifications are apparent to those skilled in the art. Therefore, unless such changes and modifications depart from the scope of the present invention, they are to be construed as being included therein.